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17. ABSTRACT (MAX. 250 WORDS) Purposes of the experiment were to discover whether the addition of auditory and visual outlines to instructional films would increase learning, to determine the effects of adding outline material to films with different degrees of intrinsic organization, to determine the effects of increasing the amount of detail in the outlines, and to determine whether the subject's intelligence affected the increase of learning when outline material was added.

Three types of film were selected: a "discrete item" or relatively unorganized type; a "logically developed" type, in which a logical or systematic content dictated the organization; and a "chronologically developed" type, which utilized the dramatic or story form of film treatment. Three versions of each of the three types of film were prepared: a "no outline" version; a "main-point outline" version; and a "detailed outline" version. Each of the nine versions was viewed by an audience of Naval recruits who were given information tests on the films immediately after viewing. Control groups who took the tests on film established that the original level of knowledge of the subject matter in the films was low. The differential effects of intelligence were studied by dividing each of the nine experimental groups into above-average and below-average segments and comparing mean film test scores between matched segments.

Film learning was significantly increased by the addition of audio and visual outline material for the film of the type which was not inherently well organized. The addition of outline material to a dramatic story-type film tended to decrease learning. A main point outline increased learning as much as a highly detailed outline. Less intelligent subjects increased their learning more than highly intelligent subjects when outline material was added.

It was suggested that film producers increase the potential effectiveness of their films by adding organizational titles and commentary on the main points of the films; however, they should not use the technique with dramatic films.

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EFFECTS ON LEARNING OF THE PROMINENCE OF ORGANIZATIONAL OUTLINES IN INSTRUCTIONAL FILMS

Human Engineering Report SDC 269-7-33

Under Contract N6onr-269 Research Conducted By:
With The Pennsylvania State College Dean S. Northrop
Instructional Film Research Program
State College, Pennsylvania

October 1952

Report prepared by the Instructional Film Research Program

- -

FOR THE PENNSYLVANIA STATE COLLEGE

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ED002701

SPECIAL DEVICES CENTER
OFFICE OF NAVAL RESEARCH
HUMAN ENGINEERING DIVISION

Purpose:

Reading material is generally organized by means of titles and subheadings to clarify and relate important study areas. The purpose of this study was to determine how the content of films can be organized and how organization affects learning.

Results:

Organization of the picture and sound in a film by means of titles and commentary was found to increase learning. A detailed outline was no more effective than one that stressed the salient points in the films. The outline was most helpful to those members of the audience having low GCT scores.

Recommendations:

Film producers should increase the potential effectiveness of their films by adding organizational titles and commentary. A detailed outline is probably not required nor should dramatic films be outlined.

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EFFECTS ON LEARNING OF THE PROMINENCE OF ORGANIZATIONAL OUTLINES IN INSTRUCTIONAL FILMS

by

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INTRODUCTION

Although reading materials are customarily organized and subdivided by chapter headings, section headings, and paragraph lead lines, instructional films seldom make use of outlines or captions in an attempt to clarify the organization of their subject matter for their target audiences. It was the purpose of the present study to investigate the effects, on learning, of adding organizational titles and commentary at appropriate points in existing instructional films. Three closely integrated aspects of the problem were studied:

1. The effects on learning from instructional films of varying degrees of prominence of organizational outline.

2. The effects of organizational outline on learning from films with different types of treatment.

3. The relationship between prominence of organizational outlining and the learning ability of audience members of high and low intelligence.

The organizational outline in an instructional film might serve any of a number of different functions.

1. It might simplify the whole body of material into a few major points and emphasize them.

2. It might verbalize information otherwise not expressed in words.

3. It might function as repetition, restating the main points in different terms.

4. It might effect closure, filling in those areas missed or not clea· to the learner.

5. It might orient the learner by providing an overview of the whole film and showing exactly where he is at any point in the film.

6. It might serve as an energy saving device by indicating to the audience how much material was to be covered and how much personal concentration would be required for mastery of the information.

7. It might promote attitude formation by concretely stating the attitudes desired.

8. It might have motivational value in stressing the importance of the material to be learned.

In this study three versions of each of three different types of films were used. The film audiences of Navy recruits were tested and compared on their ability to comprehend the factual material presented to them in the films.

EXPERIMENTAL DESIGN AND PROCEDURES

The principal hypothesis tested was that a film making internal organization of content more prominent would facilitate learning by the audience. Closely related hypotheses were:

1. Organizational outlining would aid learning from all three types of film treatments used in the experiment, and,

2. Organizational outlining in instructional films would facilitate learning of both high and low intelligence groups.

The Films. To make the findings of this investigation more widely applicable, three films dealing with different subject areas and employing different filmic treatments were used. All three films were of the informational type (as contrasted with the motivational-attitude type).

The three types of filmic treatments used were:

1. The "discrete-item" type, in which a series of relatively independent factual items is presented which have no obvious inherent organization of their own. That is, the facts could be presented in a variety of sequential arrangements. "Prepare for Gas": Navy film no. MN-5139 was selected as an example of this type of film.

2. The "logical development" type, in which the information contained in the film possesses inherent organization. Each successive fact in the "logical" type film is dependent on the establishment of the preceding point. "Chemistry of Fire" Part One: Navy film No. MN-61A, Reel 1 was selected as an example of this type of film.

3. The "chronological" type in which the information is presented within the framework of a story which involves a high degree of organization and continuity. This type of film may usually be identified as the "dramatic-instructional" film. "Castaway" Part One: Navy film No. MN-2306A, Reel 1, dealing with survival at sea, was the example of this type of treatment.

The Organizational Material Added. Before producing the three experimental versions of each film subject, some re-editing of negative copies of all three of the existing original films was necessary. Some sequences were moved to new positions in the film for better organizational structure, while a few sequences were removed entirely as not directly related to the main subject of the film.

The three versions of each film subject were given the following letter designations, and throughout the present study will be referred to by these letters:

Version A. The original, re-edited film which had an organizational structure but used no titles or commentary to make this organization clear to the audience.

Version B. This version was identical in content to Version A for each film subject, except that Version B was interrupted at from 5 to 7 appropriate places for the presentation of a title indicating the main points of the film. Explanatory commentary accompanied the visual outline. The titles contained from 4 to 8 points and subdivided the film in a manner analogous to chapter divisions in a book. All points in the outline were visible each time the title was presented, but the point in the outline which dealt with the immediately following part of the film was emphasized by "highlighting." The title without highlighting was in addition presented at the beginning and close of each film (figure 1).

How to Set up a Life Raft
How to Use Equipment
How to Avoid Overexposure *
How to get Food and Water
How to Survive a Storm

Fig. 1

Sample of Organization Titles - Version B - "Castaway"

* In this example the third heading is highlighted.

Version C. Versions C for the three films were similar to Versions B except they they included the presentation of subheadings in the organizational outline in addition to the main points as presented in Version B. As each of these subheadings was about to be discussed, the subheading frame with that particular phrase highlighted was shown. Appropriate explanatory commentary accompanied each title presentation. Version C of the three films contained 15 to 17 titles giving subheadings and 5 to 7 titles containing the main points.

Main Topics		Sub-Headings
How to Set up a Life Raft		How to Avoid Overexposure
How to Use Equipment	Followed By.....	How to Use Ointment **
How to Avoid Overexposure *		How to Use Poncho
How to get Food and Water		
How to Survive a Storm		

Fig. 2

Sample of Organization Titles - Version C - "Castaway"

* and ** highlighted in turn.

In summary, Version A was the original film with no added titles, Version B had main titles printed and read before each main sequence, and Version C had visual and spoken titles before each main sequence and each subsection as well. The commentator narrated the main-and-subheadings in Versions B and C in complete sentences so that these two versions exposed the film audiences both to visual and auditory outlines which were worded in the same general style. Further examples of the organizational titles are given in the Appendix.

The entire production of the nine experimental film versions used in this study was accomplished by the staff of the Naval Photographic Center at Anacostia, D. C., with the investigator as technical advisor. The nine versions were as follows:

I. "Discrete-item" film - ("Prepare for Gas")

Version A - original - no headings	Version B - eight main headings	Version C - eight main headings plus nineteen sub-headings

II. "Logical development" film - (Chemistry of Fire")

Version A - original - no headings	Version B - four main headings	Version C - four main headings plus fifteen sub-headings

III. "Chronological (dramatic)" film - ("Castaway")

Version A - original - no headings	Version B - five main headings	Version C - five main headings plus fifteen sub-headings

Fig. 3

Organization of Film Versions

EXPERIMENTAL DESIGN

The Experimental Population. A total of 1547 Naval recruits were tested in the experiment. The testing was done at The Great Lakes Naval Training Center, Great Lakes, Illinois.

The Tests. Multiple-choice tests were constructed to measure the learning resulting from showing each of the three film subjects. Since the object of this study was not to measure the effectiveness of repetition of the main points of the film, but rather the effectiveness of organizational outlines, test items were not constructed on those points which were specifically included in the organizational titles and commentary. Details of the tests were as follows:

Film Tests

Film	No. of Items	Reliability*
"Prepare for Gas"	75	.82
"Chemistry of Fire"	67	.90
"Gastaway"	59	.80

* Based on Kuder-Richardson Formula #20.

Film Viewing and Testing Procedure: For each of the three film subjects (i.e., "Gas," "Fire," and "Castaway") there were four test groups, - The "No Film" control group, and the Versions A, B, and C "Film Viewing" groups - 12 groups in all. There was a sufficient number of recruit companies available for this experiment to permit two companies to be used in each of the four experimental groups for each of the three types of films.

In addition to the test groups seeing the various film versions, the control groups which did not see any films were also given the tests to establish the initial levels of knowledge on the three film subjects.

Presentations of films were randomized so there would be no systematic advantage to any film version attributable to different times of day or types of activity engaged in by the recruits before the viewing. The tests were administered immediately after the subjects saw the films. Viewing and testing sessions were two hours in length, so that each subject had sufficient time to finish the test. The recruits were given a brief standardized motivating talk before the testing, and were instructed to answer all questions. Proctors supervised the testing periods.

Statistical Procedure. The primary statistical analysis consisted in running three analyses of covariance on the experimentally derived film test scores - one analysis for each of the three film subjects. The Naval General Classification Test (GCT), the Navy's group test of intelligence, was used as the matching variable in each analysis of covariance.*

GCT scores were not available for a relatively small number of subjects from each group. This precluded the further use of their data in the experiment. In no case, however, was the number of subjects in a group less than 100.

Since the mean film test score for each control group was decidedly below the mean for any of the comparable film viewing groups, it was apparent that little of the subject matter was familiar to the recruits and that the groups seeing the films learned a substantial amount from them.

Regressed means were computed for each of the experimental groups to adjust for small differences in intelligence between them. Critical-ratios were computed to test the significance of differences between the three regressed means for each of the three film subjects.

In order to determine whether the added outline material was more helpful to learners above or below average in intelligence each of the experimental groups was divided into an upper and a lower half in intelligence. Since the Naval GCT has a mean of 50, all subjects having GCT scores of 50 or above were included in the upper half of their experimental groups while the remainder of the subjects were placed in the lower half of their groups. The analysis consisted in comparing the lower halves of groups A, B, and C among themselves within each film subject, then doing the same for the upper halves of the groups seeing each version. Before making these comparisons, however, it was necessary to re-equate the half-groups in intelligence. The subjects were matched man-for-man across versions of the same film. Subjects whose GCT scores could not be so matched within the proper groups were discarded. For each film, then, there were 6 groups - 3 "upper" groups (A, B, C) with similar GCT means and 3 "lower" groups with similar GCT means. Critical-ratios were then computed between the film test means of the three "lower" groups for each film as well as between the three "upper" groups means for each film. No half-group contained less than 51 men.

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* The within treatment correlation upon which the covariances were based were: "Prepare for Gas" r=.68; "Chemistry of Fire" r=.66; and "Castaway" r=.62.

RESULTS

The mean test scores for two of the three films ("Prepare for Gas" and "Castaway") showed a tendency to increase as the amount of inserted outlining increased. A negative trend was found in the film test means for "Chemistry of Fire," however, indicating a possible tendency for the addition of outline material to inhibit learning in this type of film. Adjusting the means to compensate for initial differences in intelligence between the groups did not change these findings (Table 1).

The results may be considered statistically significant only for "Prepare for Gas" (the discrete item type of film), since only in this case did the F-ratio reach statistical significance (Table 2). In "Prepare for Gas" both outline versions B and C were significantly better ($p < 1\%$) than A, the "no-title" version; and C was slightly better than B, but not significantly so.

It seems reasonable to assume that increased learning scores might have been obtained from Versions B and C of the films if test items had been constructed to cover the specific points in the films which were also repeated in the organizational titles and commentary. Further study of this point is indicated.

These results indicate that making the organizational outline of an instructional film more prominent may be expected to increase learning significantly if the subject matter of the film is not in itself highly organized. Adding such outline material to films already well organized may even reduce learning somewhat, presumably by disrupting the continuity of the film. In those cases where prominent outlining is helpful, it is not significantly better to add more than an outline giving the main points covered by the film.

The results suggest strongly that in those films where learning increased in the prominently outlined versions ("Gas" and "Castaway") most of the increase came from the less intelligent half of the audience. In four of the six comparisons which could be made between the brighter and duller groups who saw these two films, the duller groups showed a more significant increase in learning from the outline versions than did the brighter groups (Table 3). Both of the highly significant ($p < 1\%$) differences found between outline versions and non-outline versions in Table 3 were found in the means for the less intelligent half of the populations. In no case did the more intelligent subjects profit significantly from having seen an outline (B or C) version rather than a non-outline (A) version. In this part of the analysis as in the overall analysis, the increase in learning resulting from the addition of outline material seemed confined to the "discrete item" type of film and was not made significantly greater by the addition of a great amount of detail in the organizational headings.

TABLE 1

ORIGINAL AND ADJUSTED MEAN TEST SCORES

Title of Film	No. Cases in each group	No-Film Group	Version A Group	Version B Group	Version C Group
"Prepare for Gas"	120	18.35	36.86 (36.20)*	39.09 (39.04)*	39.23 (39.94)*
"Chemistry of Fire"	124	22.27	40.98 (40.62)*	38.94 (39.29)*	37.99 (38.61)*
"Castaway"	100	20.11	42.86 (43.21)*	43.71 (43.80)*	44.53 (44.08)*

* Means in parentheses have been adjusted to compensate for initial differences in intelligence between groups. The Navy General Classification test provided the intelligence scores.

TABLE 2

F-RATIOS, DIFFERENCES BETWEEN ADJUSTED MEANS, AND T-RATIOS FOR SIGNIFICANCE OF DIFFERENCES BETWEEN ADJUSTED MEANS FOR THREE EXPERIMENTAL GROUPS[a]

Title of Film	F-ratio	Difference and t-ratio Mean B-Mean A	Difference and t-ratio Mean C-Mean A	Difference and t-ratio Mean C-Mean B
"Prepare for Gas"	10.913***	2.835 (3.398)[b]**	3.734 (4.476)[b]**	.899 (1.078)[b]
"Chemistry of Fire"	.968	-.723 (-.715)[b]	-1.407 (-1.392)[b]	-.684 (-.677)[b]
"Castaway"	.714	.590 (.790)[b]	.870 (1.170)[b]	.280 (.380)[b]

[a] Group A saw version A - original film without outlining
Group B saw version B - film with main heading outlining
Group C saw version C - film with both main and subheading outlining

[b] Figures within parentheses are t-ratios.

** 1 per cent level of confidence

*** .1 per cent level of confidence

TABLE 3

MEAN FILM TEST AND GCT SCORES FOR
HIGH AND LOW GCT GROUPS[a]

Film			A	B	C
"Prepare for Gas"	Top half	N=57	41.54 (58.47)[b]	43.12 (58.21)	43.89 (57.96)
	Bottom half	N=57	30.54 (40.53)	34.86 (40.46)	36.04 (40.39)
"Chemistry of Fire"	Top half	N=56	45.71 (58.77)	45.54 (58.64)	44.57 (58.21)
	Bottom half	N=57	35.77 (42.00)	33.44 (41.68)	34.96 (42.37)
"Castaway"	Top half	N=51	45.82 (57.98)	46.80 (58.45)	46.49 (57.80)
	Bottom half	N=52	39.60 (39.48)	40.77 (39.73)	40.92 (39.33)

[a] Note: None of the subjects in the "High" group had a GCT score below 50. None of the subjects in the "Low" group had a GCT score above 49.

[b] Note: Mean GC T scores are listed in parentheses.

TABLE 4

DIFFERENCES BETWEEN MEANS AND T-RATIOS FOR GROUPS SPLIT INTO MATCHED HIGH AND LOW GCT GROUPS

Film	B-A		C-A		C-B	
	Top Half	Bottom Half	Top Half	Bottom Half	Top Half	Bottom Half
Prepare for Gas	1.579[a] (1.359)[b]	4.158 (3.017)**	2.351 (1.910)	5.333 (3.454)**	.772 (.679)	1.176 (.985)
Chemistry of Fire	-.179 (-.117)	-2.333 (-1.592)	-1.143 (-.769)	-.807 (-.466)	-.964 (-.671)	1.526 (1.085)
Castaway	.980 (1.208)	1.173 (.967)	.667 (.683)	1.327 (1.058)	.314 (-.401)	.154 (.147)

[a] Upper figure in each case is the difference between means indicated at top of column.

[b] Figure within parentheses is t-ratio.

** Significant at 1 per cent level of confidence

CONCLUSIONS

1. The addition of titles and commentary material to a film to make the organization of the content more explicit to the audience will increase learning significantly if the film or subject matter is not inherently well organized.

2. The addition of organizational titles to a film with a dramatic or narrative type of treatment does not seem to increase learning.

3. In those films where the addition of outline material is desirable an outline indicating the most salient points in the film is likely to be as effective as a highly detailed outline.

4. In those instances where the addition of outline material does increase learning from instructional films, the less intelligent members of the audience may be expected to profit more from the additional material than the more intelligent learners.

SUMMARY

Purposes:

The purposes of this experiment were:

1. To determine whether or not the addition of auditory and visual outlines to instructional films, thus making the organization of the film and subject matter more explicit to the audience, would increase learning.

2. To determine the effects of adding outline material to films which have varying degrees of intrinsic organization.

3. To determine the effects of increasing the amount of detail in the outline material added to instructional films.

4. To determine whether the more intelligent or the less intelligent members of the audience are more likely to profit when the organization of an instructional film is made more explicit.

Procedure:

Three types of films were selected for experimention: a "discrete item" or relatively unorganized type; a "logically developed" type in which a logical or systematic content dictates the organization; and a "chronologically developed" type which utilizes the dramatic or story form of film treatment.

Three versions of each of these three types of films were prepared:

A. "No outline" version: the film in original form.

B. "Main-point outline" version: preceded and interspersed with titles and commentary outlining the main points in each film's organization.

C. "Detailed outline" version: similar to B but containing a more detailed outline of the film's organization.

Each of the nine film versions was viewed by an audience of two companies of Naval recruits. The recruits were given information tests on the film they had seen immediately after the viewing. Control groups of recruits who took the tests but saw no film established the fact that the original level of knowledge of the subject matter in the three films was low.

An analysis of covariance was made for each of the three film types. Intelligence test scores (GCT) were used to equate groups. The differential effects of intelligence were studied by dividing each of the nine experimental groups into above-average and below-average segments and comparing mean film test scores between the appropriate matched segments.

Results:

1. Film learning was increased significantly by the addition of audio and visual outline material for the film of the type which was not inherently well organized. Some evidence was found to suggest that the addition of such outlining material to a dramatic story type film might actually interfere with learning.

2. Adding a detailed outline did not increase learning significantly more than the addition of an outline stressing only the salient points in the film.

3. Where an organizational outline did augment learning from the film, most of the increase in learning was attributable to the less intelligent members of the audience.

APPENDIX I

THE OUTLINING TECHNIQUE USED IN THE EXPERIMENTAL TEST FILM "THE CHEMISTRY OF FIRE"

VERSION B

For Version B of the experimental films the outline procedure was as follows:

1. Caption frame showing the main headings to be covered in the film.
2. Repeat the Main Headings caption, with the first heading highlighted.
3. Film footage dealing with the first Main Headings material.
4. The Main Headings caption presented again.
5. Repeat the Main Headings caption, with the second heading highlighted.
6. This procedure was followed until the film material was completely shown, then the Main Headings caption was again presented, and faded out for the end of the film.

"Chemistry of Fire" Version B

SCREEN CAPTIONS	COMMENTARY SOUNDTRACK
FADEIN: (Main Headings caption) The fuel must give off vapors Sufficient oxygen must be present Further heat must be applied Causes of shipboard fires	We can have fire only if these three elements are all present: There must be a giving off of vapors which will burn. Moreover, enough oxygen must be present to feed the flames. Even with these two conditions present there will be no flame until further heat is applied. In this film we will explore these three elements, and discuss some common causes of fires on board ship.
DISSOLVE TO: (Main Headings caption with highlighted:) The fuel must give off vapors	- - - The first requirement for a fire is that "The fuel must give off vapors."
FADEOUT TO FILM FOOTAGE ON THIS TOPIC	
FADEIN: (Main Headings caption) The fuel must give off vapors Sufficient oxygen must be present Further heat must be applied Causes of shipboard fires	Before any substance will burn, then, it must give off vapors.
DISSOLVE TO: (Main Headings caption with highlighted:) Sufficient oxygen must be present	- - - Another requirement is that "Sufficient oxygen must also be present."
FADEOUT TO FILM FOOTAGE ON THIS TOPIC	

Version B

SCREEN CAPTIONS	COMMENTARY SOUNDTRACK
FADEIN: (Main Headings caption) The fuel must give off vapors Sufficient oxygen must be present Further heat must be applied Causes of shipboard fires	Up to now we have seen that a fuel must give off vapors before it will ignite. We have also seen proof that the vapors must be mixed with the right amount of oxygen before they will burn.
DISSOLVE TO: (Main Headings caption with highlighted:) Further heat must be applied	A third factor is necessary--further heat must be applied to ignite the mixture.
FADEOUT TO FILM FOOTAGE ON THIS TOPIC	

FADEIN: (Main Headings caption) The fuel must give off vapors Sufficient oxygen must be present Further heat must be applied Causes of shipboard fires	Now that we have explored the three elements necessary for starting a fire--vaporization, oxygen, and further heat . . .
DISSOLVE TO: (Main Headings caption with highlighted;) Causes of shipboard fires	Let us examine a few common causes of shipboard fires in terms of these elements.
FADEOUT TO FILM FOOTAGE ON THIS TOPIC	

FADEIN: (Main Headings caption) The fuel must give off vapors Sufficient oxygen must be present Further heat must be applied Causes of shipboard fires	In this film we have seen the three elements necessary for a fire: The fuel must give off vapors which will ignite. These vapors must also mix with enough oxygen to support combustion. Before a flame can exist, further heat must be applied. We have also seen how fires break out aboard ship when these elements are present, and how they may spread throughout a ship as long as the conditions are favorable.
FADEOUT FOR END OF FILM FOOTAGE	

APPENDIX II

THE OUTLINING TECHNIQUE USED IN THE EXPERIMENTAL TEST FILM "THE CHEMISTRY OF FIRE"

VERSION C

For Version C of the experimental films the outline procedure was as follows:

1. Caption frame showing the main headings.
2. The Main Headings caption, with the first heading highlighted.
3. Caption frame showing first main heading and its subheadings.
4. Repeat 3 with first subheading under the first main heading highlighted.
5. Film footage dealing with first subheading under first main heading.
6. Repeat caption frame of first main heading and its subheadings, with second subheading highlighted.
7. Film footage dealing with second subheading under first main heading.
8. This procedure was followed until the film material was completely shown, then the Main Headings caption was presented again for the summary, and faded out for the end of the film.

Version C

SCREEN CAPTIONS	COMMENTARY SOUNDTRACK
FADEIN: (Main Headings caption) The fuel must give off vapors Sufficient oxygen must be present Further heat must be applied Causes of shipboard fires	We can have fire only if these three elements are all present: There must be a giving off of vapors which will burn. Moreover, enough oxygen must be present to feed the flames. Even with these two conditions present there will be no flame until further heat is applied. In this film we will explore these three elements, and discuss some common causes of fires on board ship.
DISSOLVE TO: (Main headings caption with highlighted:) The fuel must give off vapors	
DISSOLVE TO: (First Subheading caption) The fuel must give off vapors Only vapors burn Solids liquified before burning Preheating liquid fuels Flashpoints of volatile liquids	The first requirement for a fire is that the fuel must give off vapors. In this part of the film we will see that only the vapors given off by a fuel burn, and that most solids must be converted into a liquid state before they will give off vapors. We also will see that many liquid fuels must be preheated before they will burn, and that highly volatile fuels, on the other hand, will burn easily.
CUT TO: (First Subheading caption, with the first subheading of it highlighted:) Only vapors burn	
FADEOUT TO FILM FOOTAGE ON THIS TOPIC	

CUT TO: (First Subheading caption, with the second subheading of it highlighted:) Solids liquified before burning	
FADEOUT TO FILM FOOTAGE ON THIS TOPIC	

Version C

SCREEN CAPTIONS	COMMENTARY SOUNDTRACK
CUT TO: (First Subheading caption, with the third subheading of it highlighted:) Preheating liquid fuels FADEOUT TO FILM FOOTAGE ON THIS TOPIC	
CUT TO: (First Subheading caption, with the fourth subheading of it highlighted:) Flashpoints of volatile liquids FADEOUT TO FILM FOOTAGE ON THIS TOPIC	
FADEIN: (Main Headings caption) The fuel must give off vapors Sufficient oxygen must be present Further heat must be applied Causes of shipboard fires DISSOLVE TO: (Main Headings caption with highlighted:) Sufficient oxygen must be present	Before any substance will burn, then, it must give off vapors. Another requirement is that "Sufficient oxygen must also be present."
DISSOLVE TO: (Second Subheading caption) Sufficient oxygen must be present How oxygen aids combustion How oxygen feeds flames Proper oxygen-fuel mixture CUT TO: (Second Subheading caption, with the first subheading of it highlighted:) How oxygen aids combustion FADEOUT TO FILM FOOTAGE ON THIS TOPIC	In this part of the film we shall see how oxygen aids combustion. We will also see how oxygen feeds the flames, and that a proper mixture of oxygen and fuel vapors is necessary before we will have a fire.

Version C

SCREEN CAPTIONS	COMMENTARY SOUNDTRACK
CUT TO: (Second Subheading caption, with the second subheading of it highlighted:) How oxygen feeds flames FADEOUT TO FILM FOOTAGE ON THIS TOPIC	
CUT TO: (Second Subheading caption, with the third subheading of it highlighted:) Proper oxygen-fuel mixture FADEOUT TO FILM FOOTAGE ON THIS TOPIC	
FADEIN: (Main Headings caption) The fuel must give off vapors Sufficient oxygen must be present Further heat must be applied Causes of shipboard fires DISSOLVE TO: (Main Headings caption with highlighted:) Further heat must be applied	Up to now we have seen that a fuel must give off vapors before it will ignite. We have also seen proof that the vapors must be mixed with the right amount of oxygen before they will burn.
DISSOLVE TO: (Third Subheading caption) Further heat must be applied Variations in heat necessary Range between flashpoints and ignition temperature How surface area affects burning rate CUT TO: (Third Subheading caption, with the first subheading of it highlighted:) Variations in heat necessary FADEOUT TO FILM FOOTAGE ON THIS TOPIC	A third factor is necessary--the further temperature which must be applied to ignite the mixture. In this part of the film we will see that there are variations in the amount of additional heat necessary, depending on the particular fuel being used. We will also see that there is a wide range between the flashpoint and the ignition temperature of fuels. The amount of surface area will also determine how fast a fuel will burn.

Version C

SCREEN CAPTIONS	COMMENTARY SOUNDTRACK
(A similar set of cuts to the highlighted second and third subheadings of this Third Subheading caption follow.)	
FADEIN: (Main Headings caption) The fuels must give off vapors Sufficient oxygen must be present Further heat must be applied Causes of shipboard fires	Now that we have explored the three elements necessary for starting a fire--vaporization, oxygen, and further heat--let us examine a few common causes of shipboard fires in terms of these elements.
DISSOLVE TO: (Main Headings caption with highlighted:) Causes of shipboard fires	
DISSOLVE TO: (Fourth Subheading caption) Causes of shipboard fires Cigarettes on paper Static electricity Oily rags on steampipes Enemy action Electric sparks	We will see that these causes are: cigarettes carelessly left on paper, static electricity, oily rags on steampipes, indirect or direct hits during enemy action, and electric sparks.
CUT TO: (Fourth Subheading caption, with the first subheading of it highlighted:) Cigarettes on paper	
FADEOUT TO FILM FOOTAGE ON THIS TOPIC	
(A similar set of cuts to the highlighted second, third, fourth, and fifth subheadings of this Fourth Subheading caption follow.)	

Version C

SCREEN CAPTIONS	COMMENTARY SOUNDTRACK
FADEIN: (Main Headings caption) The fuel must give off vapors Sufficient oxygen must be present Further heat must be applied Causes of shipboard fires	In this film we have seen the three elements necessary for a fire: The fuel must give off vapors which will ignite. These vapors must also mix with enough oxygen to support combustion. Before a flame can exist, further heat must be applied. We have also seen how fires break out aboard ship when these elements are present, and how they may spread throughout a ship as long as the conditions are favorable.
FADEOUT FOR END OF FILM FOOTAGE	